

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representation of  
The original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

# PATENT SPECIFICATION

(11) 1 394 463

1 394 463

(21) Application No. 28937/72 (22) Filed 21 June 1972

(23) Complete Specification filed 21 June 1973

(44) Complete Specification published 14 May 1975

(51) INT CL<sup>2</sup> B05D 5/08//B23K 15/00, 26/00

(52) Index at acceptance

B2E 192 193 197 19X 19Y 20Y 258 259 349 378 412 41Y  
425 42X 431 433 436 43X 43Y 442 44Y 456 459  
477 497 498 49Y 507 50Y 510 520 80X

B3R 36 37A3

B3V 4A2

C7F 1G1 2A 2F 2G 2M 2U 4F 4K

(72) Inventors BARRY LIVSEY, ERIC ANTHONY HORBURY and  
DAVID RONALD EVETTS



## (54) A METHOD OF PROTECTING A SURFACE

(71) We, ROLLS-ROYCE (1971) LIMITED, a British Company of 14-15 Conduit Street, London, W1A 4EY, formerly of 1 Bank Building, Princes Street, London EC2, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to the protection of surfaces in the vicinity of such operations as fusion welding, flame spraying or laser cutting where spatter is produced, from contamination by such spatter.

Fusion welding is a generic term covering forms of welding in which the weld is carried out solely by the melting of the metals to be joined. Electron beam welding is an example of such a form of welding.

It is found during such methods of welding, that some spattering from the molten metal often occurs. Such spattering metal readily adheres to surfaces in the vicinity of the welding operation and is normally very difficult to remove. Hitherto expensive and inconvenient operations such as grinding or machining have been utilised to restore the spatter contaminated surfaces to their original condition. It is an object of the present invention to provide a method of fusion welding in which surfaces in the vicinity of the welding operation are protected from the molten products thereof.

Flame spraying is the term used to describe a method of depositing finely divided metal and/or refractory particles in the heated, semi-molten condition to form an adherent coating on a suitable surface. The particles may be heated by means of a plasma, or by the combustion of such gases as oxygen and acetylene. It is often necessary when flame spraying to protect or mask surfaces in the immediate vicinity of the surface to be coated so as to prevent their contamination by

the particles being sprayed. It is a further object of the present invention to provide a method of flame spraying in which surfaces in the vicinity of the flame spraying operation are protected from the semi-molten products thereof.

Laser beam cutting is a method of cutting metals, ceramics etc. in which a laser beam is used to melt a small region of an article so as to produce a cutting effect. The spattering produced by such melting is liable to contaminate surfaces in the vicinity of the cut. It is yet a further object of the present invention to provide a method of laser beam cutting in which surfaces in the vicinity of the cutting operation are protected from the molten products thereof.

Thus, according to the present invention, a method of protecting at least part of at least one surface which is positioned or is intended to be placed in the vicinity of a metal and/or refractory spatter-producing process from contamination by the spattered molten or semi-molten products of such a process comprises the steps of coating said at least part of at least one surface with at least one layer of a composition comprising a mixture of an organophilic cation-modified clay (as hereinafter defined) and a volatile organic vehicle, removing substantially all of said vehicle from said coating to leave a film of said clay on said at least one surface, effecting said spatter-producing process, and removing any of said spatter together with said film.

The term metal as used herein includes alloys.

The term "organophilic cation-modified clay" as used herein means a clay modified by covering the greater part of the surface of the particles of the clay with alkyl or aryl organic radicals coupled to the clay ionically by means of an onium base.

An onium compound has been defined in

[Price 33p]

Hatch's Chemical Dictionary—Second Edition—as "A group of organic compounds of the type  $RXH_y$  which are isologs of ammonium and which contain the element X in its highest valency; where X is pentavalent as in ammonium, phosphonium, arsenium and stibonium, where X is trivalent as in oxonium, sulphonium, selenonium and stanonium compounds and, where X is trivalent, as in iodonium compounds".

They may be considered as addition compounds, this being further described under the heading of oxonium, carbonium, stibonium, inium, and —ylum.

The cation-modified clay may be produced for example by converting the organic bases to the salts formed by the addition of an acid such as hydrochloric acid or acetic acid dissolved in water, and adding the selected onium compounds to an aqueous clay dispersion.

The clays to be used in the preparation of the organophilic cation-modified clay have an exchangeable inorganic cation and are preferably those which originally exhibit a base exchange capacity of at least 40 millilitres per 100 grams of the clay, for example the bentonite group of clays which are composed principally of minerals of the montmorillonite group (including montmorillonite, hectorite, saponite and montronite) are particularly suitable. Other base exchange materials may however be used.

Furthermore, an organophilic cation-modified clay which may be used in accordance with the invention is one obtained by reacting a clay, in which at least some of the exchangeable ions, other than sodium, have been replaced by sodium ions, with an onium compound.

Details of the preparation of organophilic cation-modified clays are given in United Kingdom Specifications Nos. 664,830, 782,724 and 904,880 and in U.S.A. Specification No. 2,531,440.

Examples of organophilic cation-modified clays which may be used are dimethyldioctadecyl ammonium montmorillonite, dodecylamine montmorillonite and dimethyldioctadecyl ammonium hectorite.

The volatile liquid organic facilitates the application and deposition of a film of the organophilic clay on the surface to be protected. As the vehicle is to be removed (from the coating composition applied to the surface to be protected) prior to the commencement of the sputter producing process, organic vehicles of low and medium boiling point are preferred to those of high boiling point. In general, liquid organic vehicles having boiling points of below  $150^{\circ}\text{C}$  at atmospheric pressure are preferred. Among liquid organic vehicles of low boiling point (i.e. boiling under  $100^{\circ}\text{C}$  at atmospheric pressure) mention may be made of aliphatic and alicyclic compounds (including halogenat-

ed compounds), such as ethyl alcohol (including methylated spirit), methyl acetate, butyl chloride, trichloroethylene, 1:1:1-trichloroethane, acetone and cyclohexane, as well as aromatic compounds such as benzene and petroleum naphtha. Medium boiling point organic vehicles (i.e. those boiling between  $100$  and  $150^{\circ}\text{C}$  at atmospheric pressure) including n-amyl alcohol, n-butyl acetate and cyclohexanone as well as toluene, xylenes, monochlorobenzenes and tetrahydrofurfuryl alcohol. High boiling point organic vehicles including acetyl acetate, butyl butyrate and benzyl alcohol. Examples of other volatile liquid organic vehicles suitable for use in accordance with the invention are given in "Industrial Solvents" by I. Melan (1950) p. 36 to 42.

It may be possible in practice to use two or more volatile vehicles.

Preferably the coating composition also contains an additive which is a non-volatile organic substance having adhesive properties and capable of forming a dry film when mixed with the organophilic cation-modified clay.

As examples of said non-volatile organic additives, mention may be made of:

synthetic resins, such as acrylic resins (e.g. "Bedacryl" 122X manufactured by Imperial Chemical Industries Ltd.), the word "Bedacryl" being a Registered Trade Mark, alkyl resins, (e.g. "Epok" C.460 manufactured by British Resin Product Ltd.), the word "Epok" being a Registered Trade Mark, silicone resins (e.g. M.S. 805, manufactured by Midland Silicones Ltd.), and chlorinated rubber;

natural resins, such as resin, dammar and shellacs;

synthetic waxes, such as the Seckay waxes ("Seckay" is a registered Trade Mark) sold by Imperial Chemical Industries Ltd., Abriol waxes sold by Abriol Industrial Waxes Ltd., and chlorinated polyethylene;

natural waxes, such as carnauba wax, shellac wax, palm and cotton seed waxes;

organic substances capable of forming a dry film, such as solid saturated and unsaturated carboxylic acid (e.g. lauric, stearic, m-toluic, sebacic and fumaric acids), solid esters of saturated and unsaturated carboxylic acids (e.g. ditetradecyl sebacate) solid alcohols and glycerides (e.g. cetyl alcohol,  $\beta$ -monopalmitin and  $\alpha$ -monostearin); mention may also be made of halogenated polynuclear compounds for example, bi- and polyphenols (e.g. the mixtures sold by Monsanto Ltd. under the Registered Trade Mark "Aroclor");

liquid organic esters capable of forming a dry film and drying and semi-drying oils, e.g. cotton seed oil. More than one such binder may be used in the coating composition if desired and it may often be convenient to introduce the binder into the other components of the coating in an organic solvent, particularly when the commercially available form of the

70

75

80

85

90

95

100

105

110

115

120

125

130

binder comprises the binder in an organic solvent (as is the case, for example, with "Bedacryl" 122X).

5 The coating composition may also contain an additive which is a non-volatile simple or complex refractory oxide having filling properties and capable of forming a dry film when mixed with the organophilic cation-modified clay. The addition of such an oxide improves  
10 the covering power of the composition. More than one such refractory oxide may be added to the coating composition if desired.

15 The proportions of said clay, volatile vehicle, non-volatile additive and non-volatile refractory oxide additive to be employed in coating compositions to be used according to the method of the invention may be varied within wide limits, preferably 2 to 50 parts by weight of said organophilic cation-modified  
20 clay, 50 to 300 parts by weight of volatile vehicle, 0 to 50 by weight of non-volatile additive and from 0 to 50 parts by weight of non-volatile refractory oxide additive. The criterion in determining these portions is the ease with which an adequate film of the organophilic cation-modified clay (and the non-volatile additive and non-volatile refracting oxide additive when present) is formed on the metal  
25 surface. Generally speaking the film of the dried coating should not be less than 5 microns in thickness, but preferably is from 15 to 40 microns. In practice however it is usually

more convenient to apply a minimum number of coatings to the metal and a coating composition having a concentration of about 200  
35 grams of organophilic cation-modified clay per litre of volatile organic vehicle may be used with advantage.

In processes according to the invention in which a non-volatile additive forms part of the coating composition, good results have been obtained when the ratio of the weight of said organophilic cation-modified clay to the weight of said non-volatile organic additive  
40 is from 1:1 to 1:4.

The following method of preparation was used for the coating composition in the examples:

A weight of the organophilic cation-modified clay (constituent (a)) was milled with, a  
50 weight of oil soluble dye (if used) (constituent (b)) as a witness of coverage a weight of non-volatile refractory oxide additive (if used) (constituent (c)) and, three fifths of the weight of the volatile liquid organic vehicle  
55 (constituent (e)) in a stainless steel ball mill for four hours. The mixture was diluted with the remaining liquid organic vehicle and a weight of non-volatile organic adhesive substance (if used) (constituent (d)). The mixture was further milled for half an hour.  
60

The following table shows the constituents and proportions in the coating compositions used in the examples:

\* Con. -- abbreviated for Constituents.

Con.	Organophosphate Modified Clay (a)		O.I. Soluble Dye (b)		Volatile Liquid Organic Vehicle (c)		Non Volatile Organic Adhesive Substances (d)	
	Type	Wt	Type	Wt	Type	Wt. vol	Type	Wt/vol
1	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	300 gms	-	-	Isopropyl Alcohol	1000 gms	Bendacryl 122X	50 gms
2	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	225 gms	Waxoline Red	2 gms	Isopropyl Alcohol	1000 gms	Bendacryl 122X	50 gms
3	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	15 gms	Waxoline Red	1 gm	Toluene	500 mls	Mr-805	25 mls
4	Zeolite Clay (Bentone 27)	30 gms	Waxoline Red	2 gms	Toluene	1000 mls	-	-
5	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	30 gms	Waxoline Red	2 gms	Toluene	1000 mls	"Aroclor" 1268	50 gms
6	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	30 gms	Waxoline Red	2 gms	Toluene	1000 mls	m-toluic acid	50 gms
7	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	50 gms	Waxoline Greed	1 gm	Trichloroethylene	1460 gms	Stearic acid + Pecadryl 144TL	35 gms +49 gms
8	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	250 gms	Waxoline Red	2 gms	Isopropyl Alcohol	100 gms	-	-

Con. No.	Organophilic Modified Clay (a)		Oil Soluble Dye (b)		Volatile Liquid Organic Vehicle (c)		Non Volatile Organic Adhesive Substances (d)	
	Type	Wt	Type	Wt	Type	Wt/vol	Type	Wt/vol
9	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	100 gms	Waxoline Red	2 gms	Trichloroethylene	1000 gms	-	-

Con. No.	Organophilic Modified Clay		Oil Soluble Dye		Volatile Liquid Organic Vehicle		Non-Volatile Organic Adhesive Substance		Refractory Non-Volatile Oxide	
	Type	Wt	Type	Wt	Type	Wt	Type	Wt	Type	Wt
10	Dimethyldioctadecyl Ammonium Montmorillonite (Bentone 34)	150 g	Waxoline Red	2 gms	Butyl Alcohol	1000 gms	Bedacryl 122X	50 gms	Titanium Dioxide	100 gms
11	Bentone 34	200 g	-	-	Iso-propyl Alcohol	1000 gms	-	-	Zirconium Silicate	75 gms

#### Example 1.

Preparation (1) was prepared according to the previously described method.

Two rectangular blanks of the nickel alloy known as Nimonic 80 were treated as follows:—

1. The metal surfaces, being particularly greasy, were paraffin washed and then degreased in trichloroethylene vapor to remove organic materials. Paint was removed by suitable paint stripper.

2. An area of half of one side of each blank was masked with a masking tape suitable for dry grit blasting. The other half of the side of each blank was blasted with a dry 18/24 mesh aluminium oxide grit at 30 p.s.i.

The masking was then removed and the remaining adhesive removed by wiping with an acetone soaked cloth, and allowed to dry.

3. As soon as possible after drying, the unblasted area on one of the specimens was

15

20

ainted with one coat of the mixture prepared as above. The coating was allowed to dry in air for 10 minutes. The other specimen was left uncoated.

- 5 4. One of the specimens was pre-heated by the flame of a plasma spray gun (3MB equipment, obtainable from Metco Ltd). The powder feed was switched on and tungsten carbide/cobalt composite powder (Stellundum 52F obtainable from Deloro Stellite Ltd) was sprayed on to the blasted area, but up to the edge so an even coating was obtained all over the blasted area. This was continued until an even coating of 0.006" was produced.

- 15 The whole of this operation was repeated for the other specimen.

5. On examination after cooling the specimen coated with the mixture was observed to have some sprayed coating adhering to the masked area. This was easily scraped off with the blade of a scalpel, and the specimen was examined again. None of the sprayed coating was seen to adhere to the masked area.

- 25 The unmasked specimen had sprayed coating adhering to the unblasted area. This could not be removed with the blade of a scalpel.

#### Example 2.

- Preparation (2) was prepared according to the previously described method. In this example, two blanks of a martensitic steel known as "Jethete" ("Jethete" is a registered Trade Mark) were used and the preparation technique was substantially similar to that in Example 1.

- 35 The spraying was done with an oxygen/acetylene flame spray gun (Metco 10E) and a nickel/aluminium wire (Metco 405) was the sprayed medium.

- 40 In all other respects, including the results of the examination, this example is similar to Example 1.

#### Example 3.

- Preparation (3) was prepared according to the previously described method. The following procedure was then adapted.

- 45 1. Referring to the drawing, which is by way of example only, two cylindrical hollow test pieces 10, 12 of electron beam weldable steel were degreased by being paraffin washed and then exposed to trichloroethylene vapour.

- 50 2. As soon as possible after step 1, the inner surfaces of the test pieces 10, 12 were sprayed with one coat of the coating mixture in the region indicated at 14. The illustrated thickness of the coating is of course greatly exaggerated. The coating was allowed to dry in air for 10 minutes.

- 55 3. The test pieces were butt-welded together by means of conventional electron beam welding apparatus 16, which was rotated about the longitudinal axis 18 of the test pieces 10, 12. A weld bead 20 was formed on the inner surface of the weld, indicating that the welding

operation was proceeding satisfactorily and being effected over the full thickness of the walls of the test pieces. Weld spatter was produced and was observed to be projected from the site of the welding operation across the inside of the test pieces to the opposite surfaces thereof as indicated by the arrows 22.

4. After the welding operation was completed, the test pieces were permitted to cool, and it was found that the weld spatter which had been projected on to the coated region 14 of the surfaces of the test pieces could be removed, together with the coating, by wiping with a cloth.

#### Example 4.

Preparation (4) was prepared according to the previously described method. Two hollow cylindrical test pieces of an electron beam weldable titanium/copper alloy containing 2% of copper and the balance titanium, except for trace impurities, were electron beam welded together as described in Example 3, except that the mixture of the present example was used instead of the coating mixture of Example 3. The test pieces were degreased by means of the alkaline degreaser "Orthosil" made by the Stavelly Iron and Chemical Co. Ltd. It was found that the weld spatter could be removed together with the coating 14 by wiping with a cloth.

#### Example 5.

Preparation (5) was prepared according to the previously described method. Two hollow cylindrical test pieces of electron beam weldable stainless steel containing 18% chromium and 8% nickel were electron beam welded together as described in Example 1, except that the coating mixture of the present example was used instead of the coating mixture of Example 1. It was found that the weld spatter could be removed by wiping with a cloth.

#### Example 6.

Preparation (6) was prepared according to the previously described method. Two hollow cylindrical test pieces of electron beam weldable Nimonic 75 alloy ("Nimonic" is a registered Trade Mark) were electron beam welded together as described in Example 1, except that the coating mixture of the present example was used instead of the coating mixture of Example 1. It was found that the weld spatter could be removed by wiping with a cloth.

#### Example 7.

Preparation (7) was prepared according to the previously described method. Two hollow cylindrical test pieces of electron beam weldable stainless steel containing 18% chromium and 8% nickel were electron beam welded together as described in Example 1 except that the coating of the present example was used instead of the coating mixture of Example

1. It was found that the weld spatter could be removed by wiping with a cloth.

#### Example 8.

Preparation (8) was prepared according to the previously described method. Two rectangular blank sheets about 9 inches x 1 1/2 inches of an alloy of titanium with 2% copper plus impurities were used in this example.

The blanks were treated as follows:

1. The metal surfaces, being particularly greasy were paraffin washed and degreased using an alkaline degreaser sold commercially under the trade name "Orthosil" (available from the Stavelly Iron and Chemical Co. Ltd.) followed by swilling in hot water and allowed to dry.

2. One of the plates was painted on one side with three equally spaced one inch stripes of the mixture prepared. The coating was allowed to dry in air for 10 minutes. The other blank was left uncoated.

3. The uncoated sheet was positioned about half an inch above the coated sheet, with the flat faces facing and the top sheet displaced about one inch on the width. The coated face faced inwards.

4. The assembly was loaded into an electron beam welding machine (type 956 machine manufactured by Hawker Siddeley Dynamics Ltd.) and the chamber was evacuated to a vacuum better than 1 x 10<sup>-6</sup> mm of Mercury. The assembly was located so that the electron beam would run parallel along the long face of the top sheet, and so that the line of the weld would miss the long edge of the bottom (coated) sheet by about 0.1 inches.

5. An electron beam was run along the long face of the top sheet, at a setting such that the sheet was fully penetrated and spatter was produced from the underside of the melt run.

6. The coated sheet was then soaked in a complex alkaline cleaning agent (Ardrox 185 available from Ardrex Ltd) at 90—95° C. for 30 minutes and was washed in hot water.

7. On examination after drying, it was seen that all the coating had been removed and that in the areas where the coating had been, no spatter had adhered to the metal. On the areas on the same side where there was no coating, spatter still adhered to the metal and could only be removed by mechanical means.

#### Example 9.

Preparation (9) was prepared according to the previously described method. In this example, two sheet blanks of a martensitic steel known as "Jethete" of a similar size to those in Example 8. The blanks were treated as follows:

1. The metal surfaces, being particularly greasy were paraffin washed and then degreased with trichloroethylene vapour to remove orga-

nic materials. Paint was removed by a suitable paint stripper.

2. As soon as possible after strip (1) one surface of one of the blanks was masked to leave three areas with the width of the blank unsprayed. Three coats of the mixture were sprayed on to the remainder of the surface each coat being allowed to dry in air before the next was applied. The other blank was left uncoated.

3. From this point onwards, the procedure was substantially similar to Example 8, from and including operation 3. The result was also as in Example 8.

#### Example 10.

Preparation (10) was prepared according to the previously described method. In this example, two blanks of the nickel based alloy known as Nimonic 75 were used, and the preparation technique was substantially similar to that in Example 1.

The blanks were sprayed with "Stellite X40" a powder comprising a cobalt based alloy, which alloy also contains chromium, nickel and tungsten, (obtainable from Deloro Stellite Limited) from a plasma spray gun (3MB equipment, obtainable from Deloro Stellite Limited).

All other conditions and the final result were as in Example 1.

#### Example 11.

Preparation (11) was prepared according to the previously described method. In this example, two blanks of an austenitic steel containing 18% chromium and 8% nickel were used and the preparation technique was substantially similar to that in Example 8.

The procedure and the final result were substantially similar to those of Example 8.

Although the invention has been described with reference to the foregoing examples in which the coating composition is painted or sprayed on to the surface to be protected, it will be readily apparent to those skilled in the art and that other methods of application of the composition would be equally effective. Thus for example, it may be advantageous in some circumstances to apply the coating composition by dipping.

Whilst fusion welding, flame spraying and layer cutting have been exemplified as processes in which spatter is produced, compositions according to the present invention may be used to protect any surface liable to be spattered with molten or semi-molten metal and/or refractory particles.

#### WHAT WE CLAIM IS:—

1. A method of protecting at least part of at least one surface which is positioned or is intended to be placed in the vicinity of a metal and/or



- refractory spatter producing process from contamination by the spattered molten or semi-molten products of such a process comprises the steps of coating said at least part of at least one surface with at least one layer of a composition comprising a mixture of an organophilic cation-modified (as hereinbefore defined) and a volatile organic vehicle, removing substantially all of said vehicle from said coating to leave a film of said clay on said at least one surface, effecting said spatter producing process, and removing any said spatter together with said film.
2. A method of protecting a surface as claimed in claim 1 wherein said coating composition also contains an additive which is a non-volatile organic substance having adhesive properties and capable of forming a dry film when mixed with said organophilic cation-modified clay.
3. A method of protecting a surface as claimed in claim 2 wherein said non-volatile organic substance is an acrylic resin.
4. A method of protecting a surface as claimed in claim 2 wherein said non-volatile organic substance is a silicone resin.
5. A method of protecting a surface as claimed in claim 2 wherein said non-volatile organic substance is a solid carboxylic acid.
6. A method of protecting a surface claimed in any preceding claim wherein said coating composition also contains an additive which is at least one non-volatile simple or complex refractory oxide having filling properties and capable of forming a dry film when mixed with said organophilic cation-modified clay.
7. A method of protecting a surface as claimed in any preceding claim wherein said organic vehicle has a boiling point of below 150° C at atmospheric pressure.
8. A method of protecting a surface as claimed in claim 7 wherein said boiling point is below 100° C at atmospheric pressure.
9. A method of protecting a surface as claimed in any preceding claim wherein said coating composition contains from 2 to 50 parts by weight of said organophilic cation modified clay, 50 to 300 parts by weight of said volatile vehicle, from 0 to 50 parts by weight of said non-volatile organic additives, and from 0 to 50 parts by weight of said non-volatile refractory oxide additive.
10. A method of protecting a surface as claimed in claim 9 wherein the ratio of the weight of said organophilic cation modified clay to the weight of said non-volatile organic additive is from 1:1 to 1:4.
11. A method of protecting a surface as claimed in any preceding claim wherein said film on said at least one surface is not less than 5 microns in thickness.
12. A method of protecting a surface as claimed in claim 11 wherein said film on said at least one surface is from 15 to 40 microns in thickness.
13. A method of protecting a surface as claimed in any preceding claim wherein the organophilic cation-modified clay is dimethyldioctadecyl ammonium montmorillonite, dodecylamine montmorillonite or dimethyldioctadecyl ammonium hectorite.
14. A method of protecting a surface as claimed in any preceding claim wherein said spatter producing process is fusion welding.
15. A method of protecting a surface as claimed in any of claims 1—13 wherein said spatter producing process is flame spraying.
16. A method of protecting a surface as claimed in any of claims 1—13 wherein said spatter producing process is laser beam cutting.
17. A method of protecting a surface substantially as hereinbefore described and with reference to any of Examples 1—11 and the accompanying drawing.
18. Surfaces when protected by the method of any preceding claim.

J. C. PURCELL,  
Chartered Patent Agent and  
Agent for the Applicants.

1394463

COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of  
the Original on a reduced scale

